NOAA SMALL BOAT INCIDENT INVESTIGATION
21 APRIL 2006

Description of the Incident

At 0800 on the morning of 17 April 2006, a NOAA vessel departed from port on an education mission with faculty and students from a nearby college. There were 28 persons on board the vessel, including the captain, the vessel program's coordinator, and one program staff member who had received safety training aboard the vessel and was experienced in vessel operations. As the vessel transited to her working grounds, a few of the embarked students stood on the foredeck of the vessel holding on to the railing, many of whom were attempting to relieve the symptoms of sea-sickness. The transit was expected to last approximately 90 minutes, including passage across a channel that is known to have rough conditions. Although conditions were marginal during the channel crossing, the seas were approximately 30 degrees off the starboard bow, making for a reasonably safe ride. At about 0900, the vessel began to transit the south side of an island, where a protected lee existed and the seas were relatively calm.

At approximately 0915, the vessel had just crossed a weather line, leaving the protected lee and entering a more exposed area, where the sea state abruptly increased to a 5 to 6 foot short period wind chop. The winds were estimated to be between 20 and 25 knots at that time. The vessel was heading directly into the seas, which often results in more pronounced pounding than when the seas are a few degrees off the bow. As the vessel crested a wave and began to descend the back-side of that wave, one of the persons on the bow lost her grip on the railing and fell to the deck, on the port side of the foredeck. When the accident occurred, the captain had just reduced the vessel's speed and was on his way from the pilothouse to the bow to require that everyone come inside the vessel and find a safe place in which to complete the remainder of the transit.

Upon landing, the injured party was positioned on her back, with her left knee bent and her right leg extended, and she immediately cried out in pain. The program staff member, who was the first person to arrive on-scene, knelt on the deck to immobilize the injured party's head and neck with her knees and informed the injured party that she should stop moving and remain as calm as possible. The injured party complained of severe pain in her left knee and right ankle, as well as some pain in her back. Several other persons then arrived at the scene, including two federal employees from another agency who are also professionally-trained divers. The respondents secured the injured party to a backboard and proceeded to immobilize the left knee by securing blankets and pillows underneath and around the injured party's knee. In an attempt to prevent shock and simultaneously gauge the injured party's condition, the respondents covered the injured party with blankets to keep her warm, ensured that she was protected from any water on the deck, and continued to talk to her to help keep her calm.

The respondents decided that the next best course of action was to carry the injured party from the foredeck, along the outside deck on the port side of the vessel, to a Lab inside the vessel, where the injured party would be protected from the elements and better able to stay warm. Before transporting the injured party, the captain returned the vessel to an

area of calm water. Approximately three to four persons assisted with the transport, and the injured party remained cooperative and maintained a positive attitude throughout. After transporting the injured party, the respondents verified that she had sensation in both hands and both feet, and noted that the injured party was alert, oriented, and in good spirits. The injured party consumed a few small sips of water, and although she stated that her only known allergy was to codeine, the injured party refused aspirin. Ice was placed on the injured party's knee in alternating intervals of 10-15 minutes on, 10-15 minutes off.

As the respondents were attending to the injured party, one of the federal employees simultaneously contacted their agency's dispatch service via VHF radio. Dispatch personnel assisted in making arrangements for the vessel to transit to the closest port and meet an ambulance at the fuel pier. Once those arrangements were in place, the captain then informed United States Coast Guard of the situation via VHF radio.

During the transit back to port, the respondents decided that it was not necessary to take vital signs, since the injured party was alert, oriented, and in good spirits. They did, however, monitor the injured party continuously throughout the transit for any changes in her condition. The vessel arrived at the fuel dock in port at approximately 1025, where emergency medical personnel were awaiting the vessel. The emergency medical personnel did not collect vitals or documentation, they simply placed the patient on a gurney and immediately transported her to a local emergency medical center.

Patient's Diagnosis and Prognosis

Follow-up information received from the hospital indicates that the patient suffered a fractured left knee cap and right ankle, and underwent surgery during the evening of 17 April. As of the morning of 20 April, the patient's rehabilitation process had begun, and she was hoping to begin walking later that day. The doctors expect that the patient will regain full use of her knee. The right ankle fracture was a simple fracture that did not require casting.

Patient Testimony

During a brief phone conversation held at 0900 on 20 April 2006, the injured party described her experiences as she remembered them. She had been on the bow with a few other students, holding on to the rail. She recalled that the seas had calmed down considerably after the channel crossing, and then increased again fairly quickly. She remembers watching a particularly big wave as it approached the vessel, and everyone on the bow stated, "Watch out, this one's really big." As that wave passed and the vessel headed down the back side of the wave, the injured party recalled being forced upward off her feet, to the extent that she was mid-air. When she landed, she could not get her feet underneath her, and her left knee landed directly on the deck. She then rolled over her right ankle before landing on her back. The injured party did not believe that she struck the bitts used for line-handling, located on the port side of the foredeck.

PROPOSED CORRECTIVE ACTIONS

Background

Based on this and other incidents, it is apparent that mishaps and injuries are more likely to occur during education/outreach trips than research trips. Research trips are usually staffed with people who have experience at sea, understand how quickly conditions can change, and are fairly well prepared to respond to the motions of the vessel. Typically, the researchers who sail aboard the vessel have done so many times and are therefore familiar with the characteristics of the vessel. Many research operations require very slow speeds, which reduces the degree of pounding and makes for a more comfortable ride. In addition, marginal conditions often require that the operations be postponed until conditions improve. During such times, researchers often hunker down until the vessel reaches calm water. Many researchers are better able to cope with sea-sickness, and it is uncommon to see them wandering about the vessel looking for a safe/private place to vomit.

On the other hand, education/outreach trips may include members of the general population from all walks of life, including people who have never been on boats before, spanning a broad range of ages, fitness levels, and at-sea experience. Oftentimes, they do not have the breadth of underway experience that researchers have, and may not understand that the motions of a vessel at sea can be very unpredictable. Given that, they may be slower to react to those motions. Education/outreach trips typically include as many as 30 embarked personnel, whereas research trips usually include fewer than 10 to 12 people. Education/outreach trips are therefore more crowded, and the larger pool of people increases the chances that lesser experienced persons will be stepping aboard.

In response to this incident, the program's operations personnel have identified several ways to enhance the safety of education/outreach trips, and proposed several revisions to existing policies to minimize the risks most commonly encountered. While the proposed actions will apply to education/outreach trips, these actions could represent appropriate guidelines for research or any other type of project, at the vessel operator's discretion.

A copy of revised policies and "Go/No Go" decision-making criteria will be maintained aboard the vessel, and copies provided for all education/outreach project leads prior to departure. The vessel operator, program coordinator, or education/outreach coordinator should refer to these policies directly should a project lead challenge a "No Go" decision. The policies will enforce that program staff members reserve the right to cancel a trip at any time due to marginal weather conditions or other high-risk situations.

Risk Management and "Go/No Go" Decisions

1) To ensure that the risk management process remains fluid, written risk assessments must be conducted *for each phase* of a trip, including the transit to the working grounds, the planned operations once on site, transit back to port, etc. This is especially important when conditions and/or operations change. Whenever the level of risk is identified as too high to allow for safe operations, the vessel will not be permitted to depart unless adjustments can be made to the existing plan to mitigate anticipated risks. Vessel operators will receive formal training on the use of formal risk assessment tools. The training will include instruction on avoiding complacency, and maintaining constant awareness of the "what if's."

2) The risk assessment conducted before departure must include consideration of both weather conditions *and* the experience level of the embarked personnel. The combination of marginal weather conditions and inexperienced personnel who are prone to sea-sickness represents a strong indicator of the need for a "No-Go" decision.

3) Once underway, if several people are too sea-sick to benefit from the experience the success of the original mission will be compromised. Situations like this should be regarded as another indicator that the appropriate decision may be to turn around and return to port.

4) The vessel will not be permitted to embark on an education/outreach trip if Small Craft Advisories have been issued either prior to or during any portion of the trip. Winds that are predicted to be 20 knots or above represent conditions that should be considered "marginal," and merit extra attention when conducting a risk assessment.

5) Once underway, if winds and the sea state increase to 20 knots or higher, operations must be ceased and the existing risk assessment must be updated to reflect changing weather conditions. If it is clear that the level of risk has increased beyond the point of mitigation, the vessel must return to port in the safest manner possible. If weather conditions continue to deteriorate, all weather decks will be closed, all personnel must remain indoors, and the vessel must be secured for rough seas.

6) At least 1 crew member or program staff member must be aboard for every 10 embarked persons during education/outreach trips. This ratio does *not* include the vessel operator/captain.

Pre-emptive Safety Measures

1) Program personnel will revise the “Before you Board” documentation posted on the program’s website to reflect rough seas “readiness procedures” and safety considerations. A check-off system will be incorporated to ensure that all embarked personnel have reviewed and understand that information prior to departure.

2) The pre-departure Safety Briefing checklist will be updated to include mention of anticipated weather conditions, explanations of the behavior of the vessel at sea, and instruction on the appropriate use of hand-holds. Dramamine will be offered to those who anticipate suffering from sea-sickness at least 30 minutes prior to departure.

3) The public address (PA) system aboard the vessel will be tested to ensure that it is operational. The captains will be encouraged to make PA announcements whenever they feel it necessary to bring all personnel indoors and secure the vessel for rough seas. The captains will also be encouraged to employ the mate as a runner, who should survey all areas of the vessel to ensure personnel compliance with these announcements.

4) Anyone on the weather decks seeking relief from sea-sickness *must* wear a PFD and must remain seated during marginal weather conditions. An observer should be posted with all seasick personnel to monitor both their condition and their safety.

Implementation

Once approved, program personnel intend to implement the proposed Corrective Actions no later than Friday, 28 April 2006. In addition, a safety stand-down aboard the vessel is tentatively scheduled for Friday, 05 May 2006, where all vessel operators will convene to discuss the revised policies and conduct safety drills. The program remains open to additional suggestions and welcomes an objective third party perspective on the proposed actions.